Energy costs for Sydney Desalination Plant Pty Ltd

A REPORT PREPARED FOR IPART

November 2011

Energy costs for Sydney Desalination Plant Pty Ltd

Energy costs for Sydney Desalination Plant Pty Ltd

Figures

1 Introduction

The Independent Pricing and Regulatory Tribunal (**IPART**) is determining the prices that Sydney Desalination Plant Pty Limited (**SDP**) can charge for its water for the period to 30 June 2017.

1.1 Frontier Economics' engagement

Frontier Economics has been engaged by IPART to provide advice on the cost of energy faced by SDP. Frontier Economics' advice to IPART is to consist of estimates of:

- the long run marginal cost (**LRMC**) of energy in NSW
- the cost of Large-Scale Generation Certificates (**LGCs**) created under the Large-Scale Renewable Energy Target (**LRET**).

Our understanding is that IPART intends to use estimates of the LRMC of energy in NSW as a basis for forming a view on the likely energy price in NSW over the period to 2016/17 (and ultimately to 2029/30). Given that IPART is required to form a view on the likely energy price over the long term, we consider that adopting an LRMC approach is appropriate. There are other ways that IPART could form a view on the likely energy price, but these are less suited to analysis of the long term. First, prices for market traded derivative contracts (such as d-CyphaTrade contracts) provide a market view of future energy prices, but trade in these contracts beyond the next year or two tends to be illiquid. Second, market modelling of the energy price can be undertaken. However, over the longer-term market modelling tends to be increasingly reliant on assumptions about industry structure (including the ownership of new generation plant).

1.2 This report

This report sets out Frontier Economics' advice on the cost of energy faced by SDP. This report is structured as follows:

- Section 2 provides a brief overview of the modelling approach and input assumptions used by Frontier Economics to estimate the LRMC of energy and the cost of LGCs
- Section 3 sets out the results of Frontier Economics' modelling.

2 Overview of modelling approach

This section provides a brief overview of the modelling approach and modelling assumptions used by Frontier Economics to estimate the LRMC of energy and the cost of LGCs.

2.1 Overview of modelling approach

For the purposes of estimating both the LRMC of energy and the cost of LGCs, Frontier Economics uses *WHIRLYGIG*, Frontier's cost optimisation model.

WHIRLYGIG optimises total generation cost in the electricity market, calculating the least cost mix of existing generation plant and new generation plant to meet energy demand. When used to model the National Electricity Market (**NEM**) *WHIRLYGIG* incorporates a representation of both the supply-side and demand-side of the market. On the supply-side, the model includes all existing scheduled generators in the NEM (including a representation of their costs and their key technical characteristics), options for new generation projects in the NEM (including a representation of the costs and key technical characteristics of new generation plant) and each inter-regional interconnector between NEM regions. On the demand-side, the model includes forecasts of demand in each NEM region. The model also incorporates regulatory policies relevant to the energy market, including the LRET, the Greenhouse Gas Abatement Scheme and the Queensland Gas Scheme.

WHIRLYGIG can be used to calculate both the LRMC of energy (the additional costs associated with an increase in energy demand) and the LRMC of LGCs (the additional costs associated with an increase in target under the LRET).

2.2 Overview of modelling assumptions

WHIRLYGIG requires a range of input assumptions in order to give effect to the model's representation of the supply-side and demand-side of the NEM.

To a large extent, Frontier Economics' has adopted the same input assumptions for this review as were adopted for the purposes of IPART's recent annual review of retail electricity tariffs.[1] However, input assumptions have been updated to account for more recent information on demand forecasts, the expected capacities of existing generation plant, the introduction of a carbon price and the weighted average cost of capital (**WACC**) for generation.

---

1 For further detail see, for example: Frontier Economics, *Energy purchase costs*, A Final Report prepared for IPART, March 2010; Frontier Economics, *Energy purchase costs – annual review for 2011/12 and 2012/13*, A Final Report prepared for IPART, June 2011.

Discount rate

WHIRLYGIG optimises the total system costs of meeting demand over the entire modelling period. Total system costs are calculated as a net present cost in a specified base year using an assumed discount rate. The objective to be minimised by the model is the net present cost.

Frontier Economics has been instructed by IPART to adopt a pre-tax, real WACC of 7.8% for electricity generation to discount future values for the optimisation process. This is consistent with the modelling process adopted for IPART's recent review of retail electricity tariffs.

Demand forecasts

Frontier Economics has used energy and maximum demand projections for each NEM region based on the AEMO 2011 ESOO. Frontier Economics has been instructed by IPART to use the medium growth, 50% POE projections from the AEMO 2011 ESOO for the purposes of determining the energy and maximum demand projections.[2] However, Frontier Economics has also used the medium growth, 10% POE projections for summer and winter for the purpose of modelling reserve constraints.

Using demand forecasts for each NEM region provides an estimate of the LRMC of meeting regional demand (ie, the LRMC of meeting NSW demand). In forming a view about long-term prices, it is appropriate to estimate the LRMC to meet regional demand, since market prices are determined relative to regional demand. While the LRMC of other load shapes could be estimated (for instance the load shape of SDP), these would be more appropriate to estimating the resource costs of meeting those load shapes.

Existing NEM generation plant

Frontier Economics has used the latest information available from AEMO's website[3] on existing and committed scheduled and semi-scheduled generation plant in each region of the NEM. This provides both the identity of existing and committed generation plant and the summer and winter capacity of these generation plant.

---

2 Frontier Economics have used the medium growth, 50% POE projections for Queensland developed by AEMO (and presented in Section 3.11.3 of the AEMO 2011 ESOO) rather than the projections for Queensland developed by Powerlink (and presented in Section 3.3 of the AEMO 2011 ESOO).

3 AEMO, Tables of Existing and Committed Scheduled and Semi Scheduled Generation – by Region. Available from:

http://www.aemo.com.au/data/gendata.shtml

In addition, Frontier Economics' models require key technical[4] and cost information[5] for existing generation plant. The technical and cost information used for this review is the same as that used for IPART's recent 2011 annual review of retail electricity tariffs.

New generation plant

Frontier Economics has included the same options for new generation investment in its modelling for this review as were used for the 2011 annual review of retail electricity tariffs: black coal, brown coal, combined cycle gas turbine (CCGT), open cycle gas turbine (OCGT), wind, hydro and biomass.

Technical and cost[6] information for new generation plant is also the same as that used for the 2011 annual review of retail electricity tariffs.

Carbon price

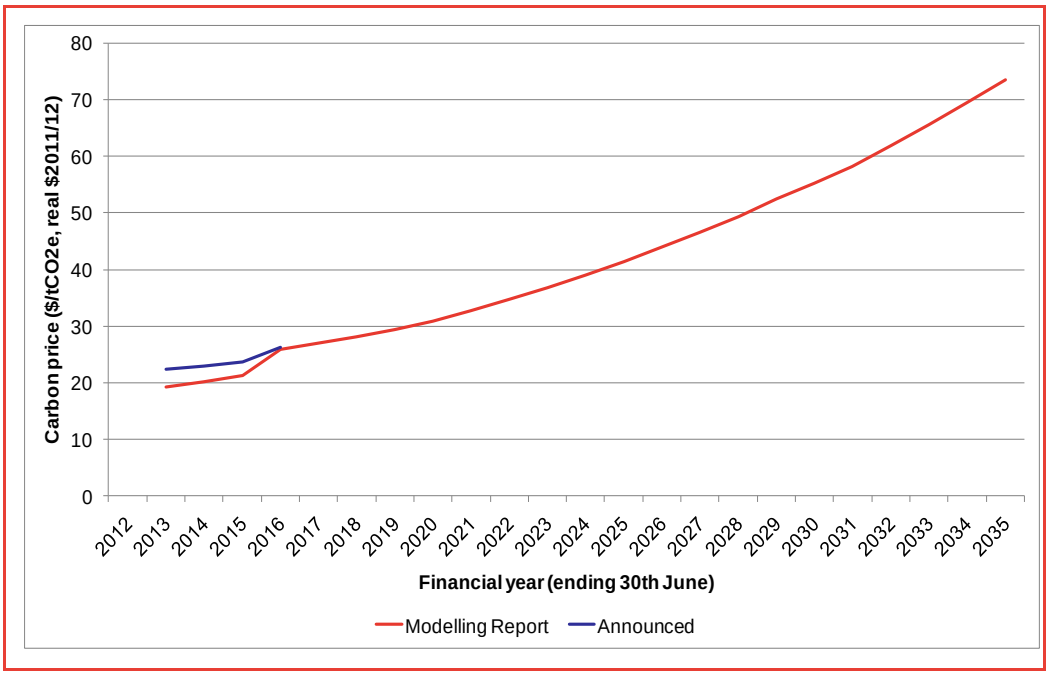
Frontier Economics has used the carbon price forecast adopted by Commonwealth Treasury in their modelling. The exception is the initial years after the introduction of the carbon price, during which years Frontier Economics has used the fixed price announced by the Commonwealth Government. The carbon price is shown in Figure 1.

4 The power station technical information incorporated in Frontier Economics' modelling includes thermal efficiency, emissions intensity, maximum capacity factor, outages rates and auxiliary power use.

5 The cost information for existing generation plant incorporated in Frontier Economics' modelling includes variable costs only (variable operating costs, fuel costs and carbon costs). Since the decision to invest in existing generation plant has already been made, fixed costs for this plant are not relevant to economic decisions regarding this plant.

6 The cost information for new generation plant incorporated in Frontier Economics' modelling includes variable costs (variable operating costs, fuel costs and carbon costs) and fixed costs (foxed operation costs and capital costs).

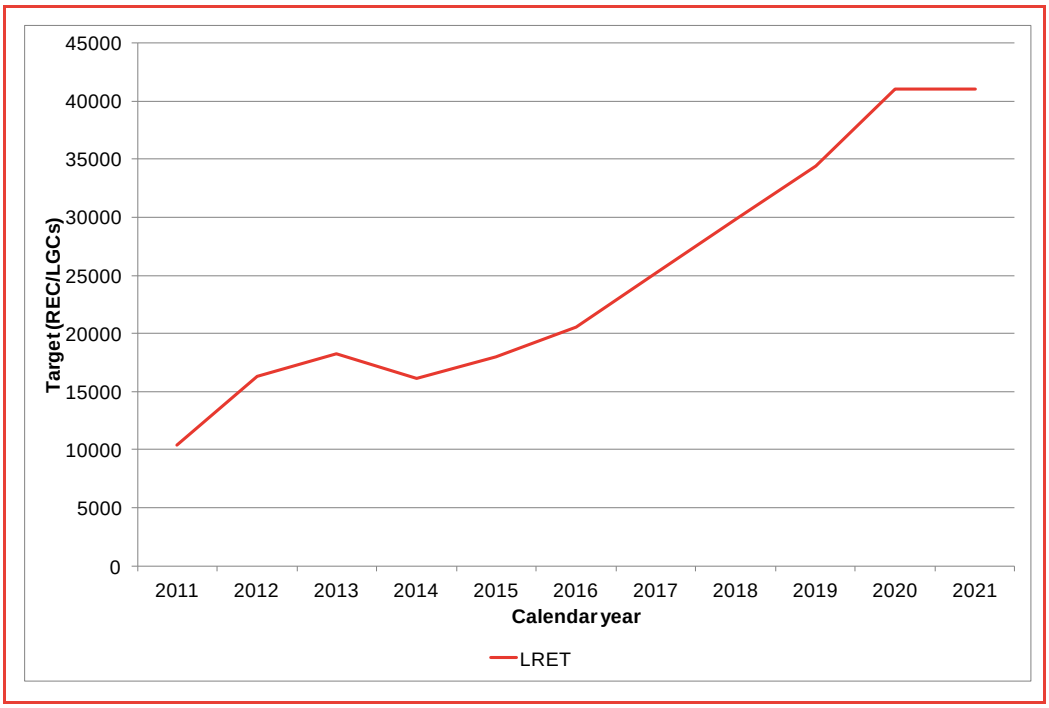
Figure 1: Carbon price



LRET target

The LRET announced by ORER has been incorporated into the modelling. The target is set out in Figure 2.

Figure 2: LRET



Source: ORER

Overview of modelling approach

3 Modelling results

This section sets out Frontier Economics' estimates of the LRMC of energy in NSW and the cost of LGCs.

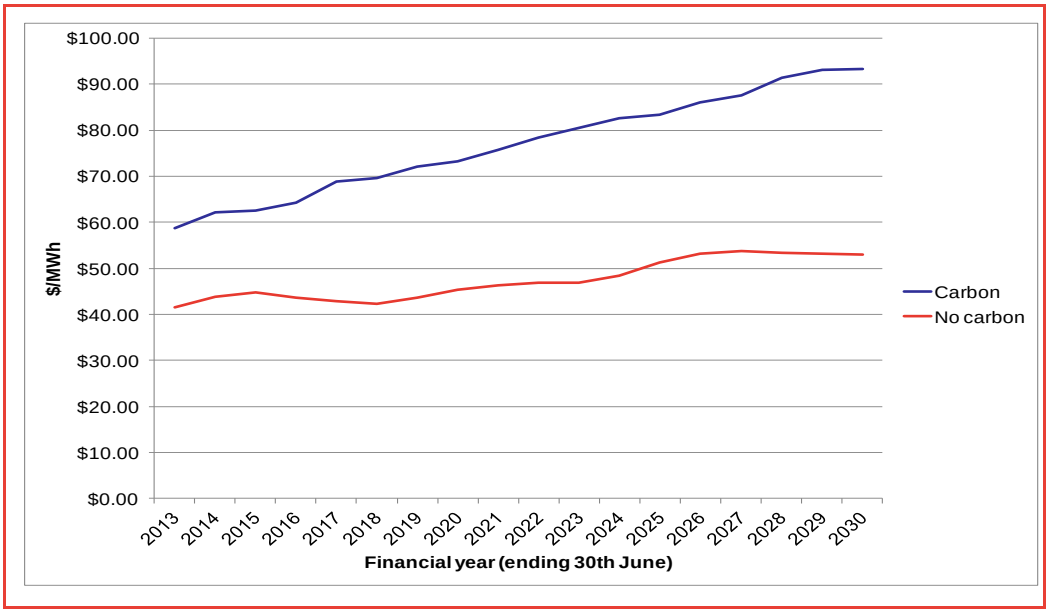
3.1 LRMC of energy in NSW

We have estimated the LRMC of energy in NSW using an incremental LRMC approach and the forecast regional demand for NSW (and other NEM regions). This approach assumes that the existing mix of generation plant in the system is in place and that demand can be served using both existing generation plant and new generation plant. Estimating the LRMC using this approach is most appropriate for the purpose of considering long term wholesale energy prices.

In contrast, for the purposes of IPART's reviews of retail electricity tariffs, we have estimated the LRMC of meeting the regulated load shape using a stand-alone LRMC approach. This approach assumes that there is currently no plant available to serve the required load. Estimating the LRMC using this approach is most appropriate for the purpose of considering the resource cost of meeting a particular electricity load.

Frontier Economics have estimated the LRMC of energy in NSW for each year from 2012/13 to 2029/30, both with and without a carbon price. The results are shows in Figure 3.

Figure 3: LRMC of energy in NSW ($2010/11)



Source: Frontier Economics

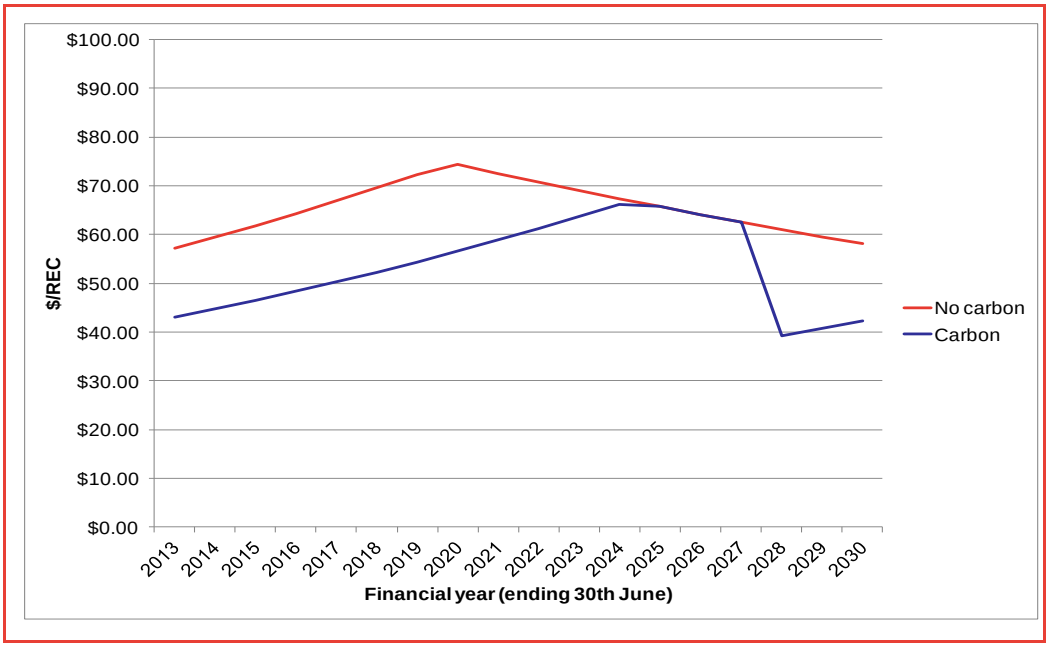
In the case without a carbon price, the LRMC starts out slightly above $40/MWh in 2012/13 and increases over the period to 2029/30 to slightly above $50/MWh. This increase – in real terms – reflects the increase in the underlying costs of generation, particularly fuel costs, over the period to 2029/30.

In the case with a carbon price, the LRMC starts out at around $60/MWh in 2012/13 and increases over the period to 2029/30 to slightly above $90/MWh. This increase – in real terms – principally reflects the increase in the carbon price over the period, but is also caused by the same increases in underlying generation costs that cause the increase in LRMC in the case without a carbon price.

3.2 Cost of LGCs

Frontier Economics have estimated the cost of LGCs for each year from 2012/13 to 2029/30, both with and without a carbon price. The results are shows in Figure 4.

Figure 4: Cost of LGCs ($2010/11)



Source: Frontier Economics

The cost of creating LGCs is effectively the size of the 'subsidy', in excess of the spot price, that is required by renewable generation plant in order to make the renewable generation plant cheaper than the alternative 'black' generation plant. Because of this, there is a relationship between the 'black' energy price and the

cost of LGCs: with a higher 'black' energy price, the 'subsidy' required by renewable generation plant is lower. This explains the difference in the cost of LGCs between the case with a carbon price and the case without a carbon price: because the carbon price increases the 'black' energy price, the cost of LGCs with a carbon price will be lower.

Frontier Economics' modelling of the cost of LGCs incorporates the renewable energy shortfall charge $65/MWh: where the tax-effective shortfall charge is lower than the cost of additional renewable generation, Frontier Economics' modelling will result in a shortfall of LGCs paid for at the shortfall charge.

In the case with a carbon price, the cost of LGCs starts at slightly above $40/LGC in 2012/13 and increases to a peak of around $65/LGC in 2023/24. At this point, a shortfall occurs, and the LGC cost is the real, tax-effective shortfall charge in that year. The LGC cost then falls for a number of years, in line with the real reduction in the shortfall charge. The LGC cost falls again in 2027/28 as a result of additional investment in renewable plant, driven by the increasing carbon price.

In the case without a carbon price, the lower 'black' energy price means that it is cheaper to pay the shortfall charge at an earlier date (implying a larger shortfall against the target). In this case, the shortfall occurs in 2019/20, and the LGC cost is the real, tax-effective shortfall charge in that year. The LGC cost then falls until the end of the modelling period, in line with the real reduction in the shortfall charge.

While Frontier Economics' modelling finds that it will be least cost for some shortfall of LGCs to occur, this need not imply that SDP would be unable to acquire sufficient LGCs to meet its own objectives. While a shortfall of LGCs does occur, the extent of this shortfall is not substantial relative to the target (particularly in the case with a carbon price). For this reason, SDP should not find it difficult to acquire LGCs at the forecast cost (even if some other liable entities pay the shortfall charge).

FRONTIER ECONOMICS NETWORK
BRISBANE | MELBOURNE | SYDNEY | BRUSSELS | COLOGNE | LONDON | MADRID
Frontier Economics Pty Ltd 395 Collins Street Melbourne Victoria 3000
Tel: +61 (0)3 9620 4488 Fax: +61 (0)3 9620 4499 www.frontier-economics.com
ACN: 087 553 124 ABN: 13 087 553 124